ATTITUDES OF MATHEMATICS AND LANGUAGE TEACHERS TOWARDS NEW EDUCATIONAL TRENDS[1]

Marie Hofmannová, Jarmila Novotná, Zuzana Hadj-Moussová

Charles University, Prague

The paper brings the results of research into affective barriers lying at the base of negative attitudes of mathematics and language teachers towards new educational trends, i.e. the teaching of mathematics in the English language in monolingual Czech secondary school classrooms. To find blocks to the use of new approaches the method of unfinished sentences was used. The results helped to improve the curricula of the joint degree teacher training courses at Charles University in Prague, Faculty of Education.

INTRODUCTION

All over the world the past decades are associated with two very important changes: the establishment of global networks of communication and the globalisation of all social, political, economic and ecological processes. In the Czech Republic, the 1990s in education can be characterised by a transition process partly due to European socio-economic integration, partly coming out of inner needs of the country. The new trends drawing from both European and overseas traditions proceeded from demonopolisation to qualitative diversification of educational opportunities.

Simultaneously, in 1996 the Organisation for Economic Co-operation and Development (OECD) prepared the "Reviews of National Policies for Education" which stated the difficulties of reforms as well as recommendations for new educational policies and structures.

In our long-term research concrete difficulties related to the diversity of new educational programs were identified. Some of them will be presented in this paper. They refer to one of the new trends introduced, i.e. the teaching of mathematics in the English language in monolingual Czech secondary school classrooms.

THEORETICAL FRAMEWORK AND RELATED RESEARCH

This field of study is approached from several perspectives of research: mathematical education (the processes of knowledge and skill acquisition), linguistics (the theory of Interlanguage, and bilingualism), and psychology (the teacher's attitudes towards students, their expectations, and the social climate of the classroom), in a broader socio-cultural framework.

Learning mathematics as a discursive activity is described by (Forman, 1996). Bilingual students learning mathematics are the interest of several research studies. (Moschkovich, 2002) holds that classroom dynamics is constituted from two basic components: the process of constructing mathematical knowledge and the process of communication. She

[1] The research was supported by the projects GA_R 406/02/0809 Language Forms and Their Impact on the Cognitive Processes Development and by the Research Project MSM 114100004 Cultivation of mathematical thinking and education in European culture.

examines where language and mathematics learning intersect, and analyses the shift of focus from language development to mathematical content.

In (Gorgorió & Planas, 2002), a wide range of failure manifestations, e.g. cognitive and emotional blockages, are identified for the learning experiences of students with limited English proficiency.

Unlike teachers, students themselves do not perceive new trends in education as a problem, conversely they are flexible and open to new methods and approaches. After the very first lesson of mathematics taught in English a 15-year old Czech student wrote:

> The instruction in a foreign language will definitely make me use the language in practice. It does not have to be just mathematics but also other subjects. One experimental lesson showed me that this is something new and useful. I am sure I would like more lessons like this.

The teachers' attitudes towards changes in education have always been more reserved. Reasons for that can be found in (Rogers, 1996). On p. 207, it is stated that adults have already invested emotional capital in acquiring knowledge and skills. "*They will expend much more in defending the integrity of this knowledge, so new learning changes will sometimes be strenuously resisted.*" This blockage arises from three causes two of which are emotional investment in knowledge, and existing prejudices. The third cause of blockages arises in those who are habit-bound, i.e. traditional patterns of thinking or ways of doing things.

It is possible to conclude by the following hypothesis: If the students are to succeed in a challenging way of learning and use the action model of simultaneous construction of mathematical knowledge and language skills, it is the teachers who will first have to change their attitudes towards new educational approaches, i.e. to avoid the transmission model of teaching and adopt cooperative and communicative teaching strategies that support creative learning (Kubínová & Novotná, 2000).

BACKGROUND

Over the past years of our classroom based research in teaching mathematics through the medium of the English language to Czech secondary school students, we identified the following:

The first observation concerns the people: both teachers and students have a limited English proficiency. Some aspects of this are dealt with in (Novotná, Moraová, Hofmannová, 2003).

The second area of research dealt with learning process. This can be characterized by several dissonances or discontinuities and accompanied by a number of myths. It is due to the shift from a *silent mathematics classroom* to a *communicative mathematics classroom*, from *receptive skills* to *productive verbal skills*. Learning mathematics is described as participation in mathematical discourse practices (Gee, 1999).

Examples of language discontinuities:

- Code-switching occurs in the students' language move from L1 (mother tongue) to L2 (foreign language) and means a break in communication. Therefore it is seen as a

negative phenomenon. To us code-switching is a natural feature, and an interim stage of foreign language development.

- The discontinuity between social talk and academic talk was described by many authors. Vygotsky (1986) speaks about the development from the language of spontaneous concepts to the language of scientific concepts. Cummins (1980) uses the terms BILC (basic interpersonal language competence) and CALP (cognitive academic language proficiency).
- Everyday register differs from mathematical register. In this sense, (Gorgorió & Planas, 2002) state that the students' move from exploratory talk and discourse-specific talk would require further research.
- The nature of the Czech language differs from the nature of the English language in a way that Czech operates with single meanings of words whereas English words have often multiple meanings. Multiple meanings perspective is studied in (Moschkovich, 2002) comparing English and Spanish.
- The shift in the definition of bilingualism constitutes further dissonance. As to the level of competence, bilingualism is now understood in a much broader way than before. It does not mean the complete balance between the two languages but a partial, functional use of the language is fully accepted.

OUR RESEARCH

The present research findings reflect the area of teacher training. We believe that without deep changes in teachers' beliefs and attitudes major changes in student learning cannot occur. This corresponds with (Rogers, 1996): "*The introduction of learning changes into the area of attitudes is perhaps the most difficult task that faces the teacher educator*."

METHODOLOGY

For the investigation of teachers' attitudes we decided to compare two groups of adults. Group A consisted of 30 teacher trainees involved in an optional course of Content and Language Integrated Learning (Mathematics in English) at Charles University in Prague, Faculty of Education. Group B was formed by 37 fully qualified practising teachers from secondary schools, participants of an in-service teacher training course.

To find blocks to the use of new approaches we used the method of unfinished sentences. They enable the respondents to express their ideas freely. To analyse the results a qualitative approach was used. For this type of analysis a lower number of respondents is sufficient. The responses were analysed only with regard to affective barriers, their causes and ways of help. During the qualitative processing of the results categories of answers were created according to the concrete nature of the gained material.

The questionnaire was not pre-announced. It was administered in Czech. It consisted of the following unfinished sentences:

I fear that

It is best if

To study at my age

When I study

I cannot learn something because

My friends say about me

I think that the others

The greatest difficulties for me are

Sometimes I cannot

I would be happy if

I am angry

It is difficult to study when

I am glad

To study

When the teacher studies

I wish I

I am looking forward to

It is high time I

When I am free

I enjoy

Based on the categorisation of results during the qualitative analysis we created the following **scheme of categories** based on (Rogers, 1996):

Inner barriers

1. fear of failing
2. fear of not meeting the requirements
3. fear of uncertain success

Causes of inner barriers: changes caused by aging, negative self-concept, too high self-requirements and too positive perception of the others, fatigue

Outer barriers

4. lack of time
5. personal and family problems

Causes of outer barriers: inability of time management, lack of calm

Consequences of affective barriers are: problems with concentration, attention, memory, lack of motivation and the need of avoidance, escape.

Examples[2]

[2] Unfinished sentences are in Italics.

Barriers

1. *I fear that* I will fail the exam. (Group A)

I fear that I am not such a good teacher as I would like to be. (Group B)

2. *I fear that* I will not finish the study. (Group A)

I fear that I will not meet the deadlines when submitting my course work. (Group B)

3. *I fear that* I will disappoint the others by failing. (Group A)

It is difficult to study when I think that I will not manage. (Group B)

4. *The greatest difficulties for me are* when I learn under pressure and do not have enough time. (Group A)

I am angry when I cannot do all the things that I have planned. (Group B)

5. *I wish I* could live somebody else's life as I am tired of my own. (Group A)

It is difficult to study when my children disturb me with their problems. (Group B)

Causes

- *To study at my age* is a bit of a problem because my peers lead a completely different style of life.
- *I cannot learn something because* I do not have logical reasoning.
- *Sometimes I cannot* overcome the feeling that I do not do everything 100 percent.
- *I think that the others* are cleverer than me.
- *When I study* I keep falling asleep.
- *When I am free* – I am not free because I have to study.
- *It is difficult to study when* I hear voices or music.

Consequences

- *Sometimes I cannot* switch off and concentrate on my duties.
- *When I study* I am very absent-minded.
- *The greatest difficulties for me are* to learn things by heart.
- *When I study* I want to know that it makes sense, then I am more motivated.
- *I wish* the exams were over.
- *I wish* I could relax on the beach.

COMPARING AND CONTRASTING RESULTS OF GROUP A AND GROUP B

In group A (undergraduate teacher trainees) all categories of affective barriers are present. In Group B (postgraduate teacher trainees) the fear of failure and the fear of not meeting the requirements dominate. The uncertainty of success is not as strong. On the other hand the fear to be ridiculed is very strong.

Also the aging process is perceived stronger by group B whereas the undergraduate students think that this problem does not concern them. Negative self-concept is a strong feature in both groups. Group A students express doubts concerning their abilities whereas Group B mention doubts about other properties necessary for successful studying.

A relatively frequent response was fatigue. The interpretation however differs: Group A students speak about laziness as if they were not allowed to be tired at their age.

The lack of time is perceived strongly by both groups. They differ in the nature: Group A is overburdened by study requirements, Group B by out of school duties. It looks as though undergraduate students are often not capable of good time management.

It is interesting to compare extra-curricular activities in both groups. Frequent complaints of the younger ones are that they cannot live the same way as their peers. Older teachers complain more of personal family or health problems. Moreover they fear of unemployment.

From the consequences of affective barriers to learning we selected the difficulty to concentrate. Group A expresses inability to concentrate due to the nature of the subject or the method (intrinsic motivation). Group B state problems with attention span caused by external factors.

The need to escape is expressed on several levels. Partly it reflects the present situation when the students feel the need to complete the duties of the semester. At the same time they express the desire to have free time, holiday. This is present in both groups' responses. The contrast appears in the place of escape. Group B are family oriented. Group A students are not happy about the status of the student and they wish for "normal" non-study life.

Group A state a number of responses expressing the need for sense in learning and learning by new non-traditional methods. This is missing in Group B. It can be explained by the fact that for older respondents teaching has become a habit, a routine. They are used to working in a traditional way.

CONCLUSIONS

It seems that adults find it difficult to change because they invested emotional capital in acquiring their knowledge and teaching skills and that is why they defend the integrity of this knowledge more strongly. Emotional investments lie at the base of negative attitudes of practising teachers towards new educational trends.

Returning back to the teacher training course for the new teacher qualification to teach mathematics through the English language to Czech students, it was necessary to discover and identify the reasons why older teachers are reluctant to changes. This enabled us to include new incentives in the course curricula to work with teachers' motivation and attitudes. Barriers can thus turn into resources (Moschkovich, 2002).

References

Cummins. J. (1980): The entry and exit fallacy in bilingual education. NABE: *Journal for the Association for Bilingual Education*. 4(3), 25-60.

Froman, E. (1996): Learning mathematics as participation in classroom practice: Implications of sociocultural theory for educational reform. In: *Theories of mathematical learning*. Eds. L. Steffe, P. Nesher, P. Cobb, G. Goldin & B. Greer. Mahwah, NJ, Lawrence Erlbaum Associates, Inc.: 115-130.

Gee, J. (1999): *An introduction to Discourse analysis: Theory and method*. New York: Routledge.

Gorgorió, N. – Planas, N. (2002). Teaching Mathematics in Multilingual Classrooms. *Educational Studies in Mathematics* **47**: 7-33.

Hadj-Moussová, Z. – Hofmannová, M. – Novotná, J. (in print). V_uka v cizím jazyce. Afektivní zábrany v u_ení. *Pedagogika*. (Teaching through a foreign language. Affective barriers in learning.)

Hofmannová, M. – Novotná, J. (2003). Attitudes Towards Teaching Mathematics in English in the Czech Republic. In: *3rd Mediterranean Conference on Mathematical Education*. Eds. A. Gagatsis and S. Papastavridis. Athens, Hellenic Mathematical Society, Cyprus Mathematical Society: 371-375.

Kubínová, M. – Mare_, J. – Novotná, J. (2000): Changing Teaching Methods in School Mathematics, An Analysis of Some Episodes from Classes. In: *Proceedings PME 24*, Volume 3. Ed. T. Nakahara, M. Koyama. Hiroshima University: 3-183 – 3-190.

Moschkovich, J. (2002). A Situated and Sociocultural Perspective on Bilingual Mathematics Learners. *Mathematical Thinking and Learning* **4(2&3)**: 189-212.

Rogers, A. (1996): *Teaching Adults. Blocks to Learning*. Open University Press.

Vygotsky, L.S. (1986): *Thought and Language*. Cambridge, MA: The MIT Press.

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